

Mr. W. H. Power's Report to the Local Government Board on an Outbreak of Fever at Bedale, in the North Riding of Yorkshire.

GEORGE BUCHANAN,

Assistant Medical Officer,

September 24, 1877.

In accordance with instructions I have visited Bedale, in the Bedale Rural Sanitary District, and have there inquired respecting certain occurrences of fever recently reported to this Board.

Upon arriving in the place (on August 29), I learned that the "fever," had been mainly enteric in character, had been restricted to Bedale town, and also that, since August 15, there had not been any further extension of the disease. The chief facts of the outbreak, as regards inception, progress, and fatality, are given in the following table:—

Week ending.	Newly attacked in each Week.		Deaths.
	Households.	Persons.	
June 23, 1877 - -	1	1	—
" 30, " - -	—	—	—
July 7, " - -	—	1	—
" 14, " - -	1	1	—
" 21, " - -	2	2	—
" 28, " - -	5	7	—
Aug. 4, " - -	9	13	—
" 11, " - -	2	10	—
" 18, " - -	—	1	5
Totals in 9 weeks -	20	36	5

Sanitary Circumstances.—The market town of Bedale, with a population of some 1,000 persons on 27 acres, is situate on the western bank of a tributary (Bedale brook) of the river Swale. The site of the town is well elevated above the brook level, and the surface has a general slope to the east and south. The soil here is said to be gravel and sandy loam overlying to a variable depth a bed of clay. The town consists of a wide and open High Street (in which is situated the Market Place), and of two narrow subsidiary streets crossing it nearly at right angles. The High Street is bordered on either side by dwellings most of which have in their rear a long narrow strip of yard and garden. These yards, commonly contain, often in proximity to the dwelling, outbuildings of many sorts, such as stables, workshops, wash-houses, lumber sheds, privy middens, pigsties, and the like. Occasionally the yards or gardens have been utilised for building purposes, and cottages have been erected thereon. Thus it has happened that certain parts of the town have become very closely built; notably in this the case in the Wynd and about Emgate. Here, dwellings of the poorer sort are much shut in by other buildings; frequently they have very small back yards, the latter sometimes without outlet except through the dwelling. Houses of the better sort are, as a rule, fairly ventilated. But many cottages, especially the older ones, are deficient in this respect; back windows are small and not unfrequently they are not made to open. In some instances dwellings are without back doors or back windows.

The Water Supply is wholly from wells, public and private. The public wells, five in number, are situated as follows:—in the Market Place, two; in Emgate, one; at Southend, one; and at Wycar, one. Private wells are usually in the back yards of better class houses; sometimes they are under the dwelling. The public wells are largely used by all classes of inhabitants, both by persons (and they are numerous) without other supply and also by householders having private wells of their own. All wells are sunk in the porous water-bearing soil overlying the clay substratum. They are therefore merely surface wells, and as such are liable to pollution with matters fouling the soil in their neighbourhood. As illustrating the fact that well water in Bedale is mainly soil water, it should be noted that it is fully understood in the place that the flooding of cellars, not uncommon in certain parts of the town, may in some measure be controlled by continued pumping of water from neighbouring wells. In several

instances the water of particular wells has fallen into disuse owing to its having acquired an unpleasant smell or taste, and occasionally obvious pollution of this sort has been noted to have occurred suddenly. Recently chemical analysis has been made of samples of water from the five public wells of the town, with the result of showing serious impurity in four out of the five samples. The fifth sample, that from the Wycar pump, might, in the analyst's opinion, "be safely used for drinking purposes." This opinion given in view of a particular sample would, I should suppose, have been more guardedly given if the analyst had been aware of the mis-use (to be noted later on) to which this Wycar pump is occasionally subjected.

Drainage.—The town is not properly sewered. Old drains, it is true, exist in certain parts of the town, but these have not been constructed on any definite plan. They are merely wall drains, or pipe drains, so put together that free soakage of their contents into the soil must readily occur. The chief of them has origin in the neighbourhood of the Wynd, and after contouring the west side of the town traverses it in a southeasterly direction, receiving by the way supplementary drainage from part of the High Street, and finally discharges into the Brook. Another of these drains in the neighbourhood of Emgate receives various tributary drains from the westward, and passing east beneath yards and gardens hereabouts, discharges into the Brook above Bedale Bridge. In addition, many dwellings have each of them independent drainage to the same brook. Drains of all sorts commonly receive, besides storms and slop water, refuse liquid of privy middens and of pigsties, stables, and fold yards, as well as overflow from cesspools. The public drains are by their construction and use quite unadapted to the work they have to perform, and as a result not unfrequently become choked. Thus considerable nuisance from overflow of drain liquid and from reflux of drain air has from time to time arisen. Drains are not ventilated, and trapping of inlets to them is rare. Such houses as have sinks are commonly by his means placed in direct connexion with the drains.

Excrement and Refuse Disposal.—Probably there are not more than a dozen water-closets in the place. Such as exist discharge to cesspools, which again have overflow pipes to the drains. The midden privy is all but universal. The midden itself is usually of vast size, and commonly it is uncovered. Into it are received the contents of one to four privies, foul refuse of all kinds, as well as ashes, and in some instances stable manure. Middens are said to be drained, but however this may be, many that I saw contained much foul liquid, and the nuisance thence arising was frequently well nigh unendurable. Privy middens of the above sort are often situated in back yards close to houses, and thus the atmosphere about dwellings is greatly polluted. For this reason people commonly keep their back windows closed to exclude if possible the foul odours. Middens are emptied at irregular intervals by the occupiers, or by arrangements with farmers, and the manure is applied to gardens or to farm land.

Keeping of Animals.—Pigs are kept in great numbers throughout the town, there being few back yards without a sty and its complement of pigs. Too often the pigsty is close to the dwelling either of the pig proprietor or of a neighbour, and from the fact that the pigsty is commonly a quagmire of filth, it may be understood that the keeping of these animals very generally constitutes a nuisance. In addition there are in certain parts of the town "fold yards" for the keeping of cattle. These also are often foul quagmires (that near to the west end of the Wynd is an extreme instance), and contribute with the pigs and with the middens to the general pollution of the air of the town.

Origin and Spread of the Fever.—The evidence that has been given respecting the sanitary circumstances of the town is proof that unusual facilities for the transmission of enteric fever exist. In Bedale it has needed but the introduction to the town of a case of enteric fever from which, by the bowel discharges of the patient, specific infection of a privy or privies, of the drains common to several groups of dwellings, or of one or more wells in general use, might chance to have occurred, almost to ensure conveyance of the disease to many others of the inhabitants. Now, introduction of fever to the town undoubtedly did occur in the person of a child named Whitton, who with her mother and other children came from Leeming Bar to Bedale about mid June. Within two days of her arrival this child sickened with illness which afterwards proved severe enteric fever, and subsequently others of her family suffered from like disease. The facts that I have collected respecting this and other families invaded leave little doubt that the fever in this family was the starting point of the Bedale outbreak. But as to the precise channel (such as infected privy, infected drains, or infected wells) whereby the disease became distributed to other families, the case is

less clear. And this not because there is failure of evidence against all or any such channels of distribution, but by reason of the difficulty of excluding any one channel from participation in the spread of the disease. Probably the chief drain of the place, that on its western confines, has been the source whence many of the main group of cases acquired infection; a large proportion of the households invaded, besides Whitton's, having been, by their drainage arrangements, connected more or less nearly with this drain, as also was the national school at which children attacked elsewhere in the town habitually attended. But the Wycar pump cannot be altogether excluded as an agent in the spread of fever. At first, it was thought that in view of the isolated position of this pump, and of the absence from its neighbourhood of any likely source of pollution, the well water could hardly have contributed to the spread of the fever; and this, notwithstanding the fact that no less than 15 out of the 20 families invaded obtained their drinking water from this source. Subsequent experience has however modified this impression, for it has been ascertained that to the trough of this pump all kinds of foul matters are brought for washing. Indeed it is stated by an eye witness to the procedure, that tools and barrows used in the emptying of privies are not unfrequently cleansed under the pump. Such practices are in the highest degree dangerous, since the slop drain of the pump, close to if not over the well, constantly becomes choked, and the waste water, often polluted in the above ways, cannot fail to soak back into the well itself.

W. H. POWER.

Local Government Board,
5th September 1877.

RECOMMENDATIONS.

The chief sanitary wants of Bedale are as follows:—

1. *Water Supply*.—An abundant and wholesome supply of water separately served to every dwelling in the place. Such supply (scarcely, in view of the very doubtful character of the well water of the place, to be obtained within the town limits) should be given under pressure from a service reservoir, fed by gravitation from an adequate and unobjectionable gathering ground; or filled by pumping from a well or wells sunk in a quarter wholly free from risk of pollution. All wells in the town that can be proved to be polluted should be closed.

2. *Drainage*.—A proper system of sewers is greatly needed. Such system should at least provide for the carrying off of slop and refuse water, and should also render feasible the draining of the basements of dwellings. In the event of the adoption of a system of sewers and of water supply under pressure being decided on, the sanitary authority will have to consider in connexion therewith the question of excrement disposal. If a watercloset system be adopted it should be borne in mind that each closet will require an adequate supply of water. This should in each instance be an indirect supply, either by separate cistern or by service box, so that risk of contamination through the closets of the water supply of the town may be avoided. Proper trapping of all inlets to house drains will be necessary, and in addition soil pipes, drains, and sewers should themselves be freely ventilated. As regards sinks within dwellings the sink pipe may conveniently and safely be dealt with by causing it to be terminated externally to the building over an open channel leading to a trapped drain inlet. Whatever be the system of sewerage or drainage eventually decided on, regard must be had to the necessity for putting an end to fouling by sewage of the Bedale brook.

3. *Excrement and Refuse Disposal*.—If a system of excrement disposal by water carriage be not adopted, it will still be the duty of the sanitary authority to see that excremental refuse is dealt with by some method less objectionable than that at present in force. To this end one or other of the dry systems described in the Report to the Board "On certain means of preventing excrement nuisances in towns and villages" would appear well adapted to the particular requirements of Bedale. But if a midden system be retained, the receptacle for excrement and other solid refuse should be greatly reduced in size so as to necessitate frequent emptying of its contents. In addition it should be made watertight, and all rainfall and slop water should be excluded from it. In any case the Sanitary Authority should take into its own hands the emptying and cleansing of all excrement or refuse receptacles in the place.

4. *Keeping of Animals.*—Action for the abolition, or at least for great restriction, of existing pig nuisances is urgently required. For this purpose proceedings under the nuisance clauses of the Public Health Act would probably prove effective. But for proper regulation of the town in this as well as in many other sanitary respects the authority might well seek from this Board powers for the enactment of certain urban byelaws.

5. *Arrest of Infection.*—With a view of arresting the progress of dangerous infectious sickness, it is important that the Sanitary Authority should have in readiness some standing means for the isolation of persons of all classes who cannot properly be isolated in their own houses, and some means for disinfection of infected clothing, bedding, &c. Such means should be provided beforehand, so as to be available when required. In connexion herewith the Sanitary Authority would do well to consult the Memorandum of this Board on Hospital Accommodation.

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Dr. Thorne Thorne's Report to the Local Government Board on an Epidemic of Enteric Fever at Bradford, Wilts, and on the General Sanitary Circumstances of the Town.

EDWARD C. SEATON, M.D.,
Medical Department,
October 26, 1877.

I.—GENERAL DESCRIPTION.

The town of Bradford, in Wiltshire, is situated on both banks of the river Avon, about eight miles above Bath. Roughly speaking, about four-fifths of the town lie on the northern side of the stream, occupying both the low-lying land in its immediate vicinity, and also the precipitous rocks of the Great Oolite, which rise rapidly until they reach a height of about 200 feet above the river, and on which are built a series of terraces, interspersed with rugged projections and small combs filled in with abundant foliage, the whole giving a striking and picturesque appearance to the town. On these terraces the houses, which are mostly occupied by the poor, are somewhat curiously constructed, two tenements being built, one over the other, in one block, the entrance to the lower one being in one street in front, and that to the upper one in another street behind, and at a higher level. On the south side of the Avon the elevation above the river level is much less. The town is within an Urban Sanitary District, which consists of the town proper and of an area outside. The latter includes several villages and hamlets. The whole district has a population estimated at 7,000, and it is under the control of a body of Commissioners appointed under a special Act. The staple trades of the place are the manufacture of cloth and of india-rubber goods.

II.—GENERAL SANITARY CIRCUMSTANCES.

1. *Water Supply.*—On the north side of the river the water-supply is derived from springs, which crop out in numerous places in the lower half of the town, the water being generally procured from wells or from reservoirs constructed in the rock. Some of the reservoirs are large and afford a public supply; others are small, and are used for the purposes of private dwellings. Unfortunately, however, the numerous fissures in the rock, through which the water flows so freely, have long received a considerable portion of the liquid filth of the place, and so numerous and widely spread have the sources of pollution to the water-bearing strata in consequence become, that it is all but impossible to say, with regard to any of the numerous supplies, that they are free from the risk of being fouled. With respect to the majority, it is quite evident that they are subject to such risk, and some of them have become so obviously foul, that their use has been abandoned. Owing to this cause, and also to the circumstance that in the higher-lying portions of the town, no water can be procured except at a considerable depth, the supply is very scarce in several populous localities. Some of the inhabitants rely mainly on rain-water, others have to purchase a supply, or to procure it at such a distance from their homes as almost to prohibit the use of water at all. One person told me that the difficulty of carrying a scanty supply up the steep incline to her house was such, that one bucket-full had to serve the purposes of her household for several days, and I found it a not unfrequent source of complaint that cleanliness was under such circumstances all but impossible. On the south side of the river the supply is derived from wells, and some of these cannot, owing to the circumstances by which they are surrounded, be free from the risk of pollution.

2. *Means of Sewerage and Drainage.*—Until quite recently Bradford has throughout been most defectively sewered. The main sewers as well as the private drains have almost exclusively consisted of square stone channels often resting on, or being more or less excavated in the rock, through the fissures in which their contents could in part soak away. But in some portions of the town there have been no drains at all; liquid refuse being thrown either into the roadway, or down the slopes of the rock, or again into cesspools the contents of which could freely soak away. In 1873, however, the Commissioners employed an engineer to prepare plans for the drainage of their district, and when I visited the town I found that about one-half of it had been provided with new sewers, although these had not yet been brought into general use. The remainder of the town either still retains its old sewers and drains, or remains without any provision for drainage, and no steps are at present in

progress for remedying this serious defect. So much of the sewage as does not soak away empties itself into the river. With regard to the system of sewerage now under construction, I would only remark that its means of ventilation are imperfect. At certain intervals, shafts, the number of which is as yet not known to the Sanitary Authority, have been constructed with openings on the level of the road. Each of these shafts is covered at the surface with an iron slab, having in it four small apertures, and in the upper part of the shaft is placed a charcoal basket, the contents of which were found to be mixed with road detritus. These baskets obviously form a serious hindrance to efficient ventilation.

3. *Means for the disposal of Excrement and Refuse.*—There have for many years been a limited number of waterclosets in different parts of the town, and they have emptied themselves into the old stone drains; but until recently the common privy-with-pit has been the usual closet in use, and the conditions under which it has existed make it evident that it must materially have assisted in fouling the water-bearing strata. Recently, however, a large number of closets have been fitted with pans and connected with the sewers, but they have not been provided with means of flushing. The consequence is that pans in many instances are already becoming foul. Where common-privies remain they are a source of nuisance and of injury to health. In some parts of the town there is great scarcity of closet accommodation in any form; there being instances, for example, in which there is only one privy common to as many as six and seven dwellings. There is in several parts of the town considerable neglect in the disposal and removal of house refuse, such refuse being at times thrown down the sides of the rock, or allowed to accumulate in heaps in close proximity to dwellings.

4. *Slaughter-houses.*—During the course of my inquiry several complaints were made to me with regard to the condition of the slaughter-houses. These are mostly situated in confined localities where they are surrounded by dwelling-houses, and they can hardly fail to be a frequently recurring source of nuisance. They drain into the river in a central part of the town, the stream being strongly tinged by the blood flowing from them. There are no *byelaws* for the control of the slaughter-houses or for any other purpose.

III.—PREVALENCE OF ENTERIC FEVER.

During the present year *enteric fever* has been somewhat widely prevalent in Bradford. With regard to the immediate origin of the outbreak, it was found that inquiry would lead to no useful result, for cases of enteric fever, generally of a mild type, have for some years past been of frequent occurrence in the town. The average annual number of deaths from this cause during the past five years has been four, the number having varied from seven in 1872, to two in 1875. But, as far as could be ascertained, the first case this year took place in January, when a man who resided in the lower part of the town on the north side of the river, and whose occupation rendered it difficult to trace his prior movements, sickened and subsequently died. The second case which could be traced was also a fatal one, it occurred towards the end of February, in one of the terraces before referred to; the person attacked residing in a house having its water supply from a small tank excavated in the rock beneath it. Behind the house and at a higher level was a large and pervious privy-pit also sunk in the rock. About the middle of March a third case occurred in the person of a young man who worked at this house; he also died. The next case that could be heard of occurred on the same side of the river, in the lower part of the town, at a house known as the Chantry. This house derives its water-supply from a small reservoir excavated in the rock and fed by springs the course of which is very uncertain, but in whatever direction they flow it is difficult to conceive how they can entirely escape the risk of excremental pollution at some point or other. At a short distance behind the tank, and at a higher level, spring water was seen oozing through the rock on to the surface of the ground, then becoming mixed in its course with stable and privy drainage, and subsequently sinking again into the crevices of the rock. Within a few days of the first attack at the Chantry several others had occurred there; more followed during the latter half of April and the beginning of May, 10 persons in all having been attacked by the 8th of the latter month. In the meantime also several other attacks had occurred in various localities on the north side of the river.

In the neighbourhood of the Chantry springs abound, and experiment proved that a special water supply which was collected in a small reservoir close to the house, was derived from springs flowing beneath the foundations of the Chantry, at a point

where they can hardly fail to have been subject to the risk of pollution by means of the soakage from a old stone sewer, which in its course received the contents of two of the Chantry waterclosets. The water supply in question was found to be delivered to two private houses, and to a public tap which was frequently resorted to by children attending a neighbouring school, as well as by other persons. From the end of April to the middle of July about 20 children residing in different parts of the town, but all attending the school in question, were attacked with typhoid fever. The disease also appeared amongst others resorting to the public tap, and cases occurred in both private houses referred to. Indeed there can be no doubt but that, at some point or other in its course through the Chantry premises, the water flowing into the small reservoir referred to received the specific poison of enteric fever.

In all between 50 and 60 persons have suffered from enteric fever in Bradford this year, and of these eight have died. And it is evident that the spread of the disease has been mainly due to the use of polluted water, especially of that in the neighbourhood of the Chantry. This view receives strong confirmation from the fact that the only cases which occurred on the south side of the river were in children attending the school referred to, and that the closing of the public tap and of the school was speedily followed by a cessation of the epidemic amongst the school children.

It should also be noted that during the early part of the epidemic the conditions favouring excremental pollution of the various sources of water-supply were exceptional, owing to the circumstance that during the progress of the works of sewerage, and the process of replacing common-privies by pan-closets communicating with the sewers, the soil and rock, which in many places have been charged with filth, had been subjected to extensive disturbance. At one point just above the Chantry I learnt that two common-privies had been demolished, and that the attempt to fix pan-closets on the same site had to be abandoned, because the large amount of spring water which was found flowing through the privy-pit and then disappearing in the crevices of the rock rendered the work impossible. Indeed the sources of pollution to which the springs were found to be exposed in the vicinity of this house, resembling as they do in their essential features those found in many other parts of the town, suffice to show that the risk of water contamination is very general in Bradford.

Sanitary Action.—As the result of an interview which I had with the Sanitary Authority a resolution was passed to this effect: that an officer should be appointed to make daily inquiry of the various medical practitioners in the town as to the existence of fresh cases, and that, under the guidance of the medical officer of health, steps should be taken with a view to the adoption of an efficient system of disinfection. Up to that time I could not learn that any such measures had been adopted.

112102.

R. THORNE THORNE.

Local Government Board,
September 1877.

RECOMMENDATIONS.

I. The town should throughout be provided with a proper water-supply, and skilled advice should be sought as to the best means by which this may be effected.

II. All polluted water-supplies should be dealt with in accordance with the provisions of section 70 of the Public Health Act, 1875.

III. The efficient sewerage of the entire town should be proceeded with without further delay. With a view to the efficient ventilation of the sewers, the charcoal baskets which now block up the shafts opening in the level of the streets should be removed. Proper measures should also be adopted for dealing with the sewage at the outfall.

IV. The adoption of the watercloset system having been determined on, its general adoption should as far as possible be secured throughout the town, and all offensive privies should without delay be got rid of. All waterclosets should, however, be provided with efficient means of flushing. In no case should the amount of closet accommodation be less than one closet for two houses.

V. Proper covered receptacles should be constructed to receive house refuse, and the Sanitary Authority should see that their contents are removed at regular and frequent intervals.

VI. All existing slaughter-houses should be registered and subjected to proper regulations and frequent inspection. Any of them which are then found to constitute a nuisance should be dealt with as such. Any new slaughter-houses should be duly licensed, and none should be sanctioned within the limits of the town proper.

VII. The Sanitary Authority should without delay proceed to prepare byelaws with a view to the more efficient control of their sanitary district, and in carrying out this recommendation they should consult the model byelaws recently issued by the Board.